

**WHAT IS CLAIMED IS:**

1. A method of generating two-dimensional masks from a three-dimensional model comprising:  
providing a three-dimensional model representing a micro-electro-mechanical structure for manufacture and a description of process mask requirements;  
reducing the three-dimensional model to a topological description of unique cross sections;  
selecting candidate masks from the unique cross sections and the cross section topology; and  
reconciling the candidate masks based on the process mask requirements description to produce two-dimensional process masks.
2. The method according to Claim 1 further comprising:  
separating the three-dimensional model into at least one independent model bodies.
3. The method according to Claim 2 further comprising:  
searching the at least one independent bodies for unique cross sections; and  
arranging the cross sections based on mutual topological relationship.
4. The method according to Claim 2 further comprising:  
reducing the at least one independent model bodies to topology graphs including at least one node.
5. The method according to Claim 4 further comprising:  
selecting candidate masks based on structure of the topology graphs.
6. The method according to Claim 4 further comprising:  
analyzing the topology graphs comprising:  
calculating area of a topology graph node;  
categorizing the node relative to topological neighboring nodes; and  
identifying masks according to predetermined heuristic rules.

7. The method according to Claim 1 further comprising:  
summing the candidate masks; and  
reconciling the summed candidate masks comprising:  
performing selected operations based on process constraints, the selected  
operations being selected from among a group comprising:  
reordering, merging, and splitting the summed candidate masks.
8. The method according to Claim 7 wherein:  
the process constraints are selected from among a group comprising number of  
layers, material type of a layer, thickness of a layer, mask type, and  
number of masks.
9. A method of generating two-dimensional masks from a three-dimensional  
model comprising:  
disassembling the three-dimensional model into one or more independent bodies;  
processing the individual independent bodies comprising:  
generating a topology tree composed of one or more nodes;  
categorizing the one or more nodes of the topology tree; and  
locating deposition boundaries to define one or more deposition domains;  
processing the individual deposition domains comprising:  
locating candidate masks; and  
saving masks in a candidate mask set; and  
summing the candidate masks in the candidate mask set.
10. The method according to Claim 9 further comprising:  
providing the three-dimensional model that represents a micro-electro-mechanical  
structure for manufacture.
11. The method according to Claim 9 wherein:  
processing the individual independent bodies further comprises:  
combining redundant nodes.

12. The method according to Claim 9 further comprising:  
for a model that cannot be produced within constraints of a specified process or no particular process is specified, defining process steps that are capable of producing the model.
13. The method according to Claim 9 further comprising:  
supplying a three-dimensional model with a specific manufacturing process for production of the device corresponding to the model undefined; and  
generating a process description for a manufacturing process capable of producing the device in combination with production of the two-dimensional masks.
14. The method according to Claim 9 further comprising:  
reconciling the candidate masks in the candidate mask set with target process constraints.
15. The method according to Claim 14 wherein:  
reconciling the candidate masks comprises inverting etching sense of a candidate mask to meet a target process constraint.
16. The method according to Claim 14 wherein:  
reconciling the candidate masks comprises dividing candidate mask layers that are thicker than layers in the target process and placing a sacrificial oxide mask identical to the divided mask between the divided mask layers.
17. The method according to Claim 14 wherein:  
reconciling the candidate masks comprises rearranging order of candidate masks for a target process that the rearrangement does not change result.
18. A method of generating two-dimensional masks from a three-dimensional model comprising:  
analyzing cross sectional topology of a three-dimensional body;  
generating a topology tree describing connectivity and relationships between cross sections, the topology tree including one or more nodes and branches connecting the nodes;

- processing the individual nodes comprising:
- calculating a cross sectional area of the node; and
  - categorizing the node relative to topological neighboring nodes;
- processing the individual branches comprising:
- locating deposition boundaries to define one or more deposition domains;
  - and
- processing individual deposition domain regions between the deposition boundaries comprising:
- defining a mask set and deposition thickness.
19. The method according to Claim 18 further comprising:
- identifying independent three-dimensional bodies in the three-dimensional model;
  - processing the individual independent three-dimensional bodies; and
  - summing the mask sets for the processed independent three-dimensional bodies.
20. The method according to Claim 19 further comprising:
- reconciling the mask sets with target mask process constraints.
21. The method according to Claim 19 further comprising:
- joining redundant nodes of the processed individual nodes.
22. An article of manufacture comprising:
- a controller usable medium having a computable readable program code embodied therein for generating two-dimensional masks from a three-dimensional model, the computable readable program code further comprising:
    - a code capable of causing the controller to access information relating to a three-dimensional model representing a micro-electro-mechanical structure for manufacture and a description of process mask requirements;
    - a code capable of causing the controller to reduce the three-dimensional model to a topological description of unique cross sections;
    - a code capable of causing the controller to select candidate masks from the unique cross sections and the cross section topology; and

a code capable of causing the controller to reconcile the candidate masks based on the process mask requirements description to produce two-dimensional process masks.

23. The article of manufacture according to Claim 22 further comprising:  
a code capable of causing the controller to separate the three-dimensional model into at least one independent model bodies;  
a code capable of causing the controller to search the at least one independent bodies for unique cross sections; and  
a code capable of causing the controller to arrange the cross sections based on mutual topological relationship.

24. The article of manufacture according to Claim 22 further comprising:  
a code capable of causing the controller to separate the three-dimensional model into at least one independent model bodies;  
a code capable of causing the controller to reduce the at least one independent model bodies to topology graphs including at least one node; and  
a code capable of causing the controller to select candidate masks based on structure of the topology graphs.

25. The article of manufacture according to Claim 22 further comprising:  
a code capable of causing the controller to separate the three-dimensional model into at least one independent model bodies;  
a code capable of causing the controller to reduce the at least one independent model bodies to topology graphs including at least one node; and  
a code capable of causing the controller to analyze the topology graphs comprising:  
a code capable of causing the controller to calculate area of a topology graph node;  
a code capable of causing the controller to categorize the node relative to topological neighboring nodes; and  
a code capable of causing the controller to identify masks according to predetermined heuristic rules.

26. The article of manufacture according to Claim 22 further comprising:  
a code capable of causing the controller to sum the candidate masks; and  
a code capable of causing the controller to reconcile the summed candidate masks comprising:  
a code capable of causing the controller to perform selected operations based on process constraints, the selected operations being selected from among a group comprising: reordering, merging, and splitting the summed candidate masks.
27. An article of manufacture comprising:  
a controller usable medium having a computable readable program code embodied therein for generating two-dimensional masks from a three-dimensional model that represents a micro-electro-mechanical structure for manufacture, the computable readable program code further comprising:  
a code capable of causing the controller to disassemble the three-dimensional model into one or more independent bodies;  
a code capable of causing the controller to process the individual independent bodies comprising:  
a code capable of causing the controller to generate a topology tree composed of one or more nodes;  
a code capable of causing the controller to categorize the one or more nodes of the topology tree; and  
a code capable of causing the controller to locate deposition boundaries to define one or more deposition domains;  
a code capable of causing the controller to process the individual deposition domains comprising:  
a code capable of causing the controller to locate candidate masks;  
and  
a code capable of causing the controller to save masks in a candidate mask set; and  
a code capable of causing the controller to sum the candidate masks in the candidate mask set.

28. The article of manufacture according to Claim 27 further comprising:  
a code capable of causing the controller to combine redundant nodes in the code  
capable of causing the controller to process the individual independent  
bodies.
29. The article of manufacture according to Claim 27 further comprising:  
a code capable of causing the controller to reconcile the candidate masks in the  
candidate mask set with target process constraints.
30. An article of manufacture comprising:  
a controller usable medium having a computable readable program code embodied  
therein for generating two-dimensional masks from a three-dimensional  
model that represents a micro-electro-mechanical structure for  
manufacture, the computable readable program code further comprising:  
a code capable of causing the controller to analyze cross sectional  
topology of a three-dimensional body;  
a code capable of causing the controller to generate a topology tree  
describing connectivity and relationships between cross sections,  
the topology tree including one or more nodes and branches  
connecting the nodes;  
a code capable of causing the controller to process the individual nodes  
comprising:  
a code capable of causing the controller to calculate a cross  
sectional area of the node; and  
a code capable of causing the controller to categorize the node  
relative to topological neighboring nodes;  
a code capable of causing the controller to process the individual branches  
comprising:  
a code capable of causing the controller to locate deposition  
boundaries to define one or more deposition domains; and  
a code capable of causing the controller to process individual deposition  
domain regions between the deposition boundaries comprising:  
a code capable of causing the controller to define a mask set and  
deposition thickness..

31. The article of manufacture according to Claim 30 further comprising:  
a code capable of causing the controller to identify independent three-dimensional bodies in the three-dimensional model;  
a code capable of causing the controller to process the individual independent three-dimensional bodies;  
a code capable of causing the controller to sum the mask sets for the processed independent three-dimensional bodies;  
a code capable of causing the controller to reconcile the mask sets with target mask process constraints; and  
a code capable of causing the controller to join redundant nodes of the processed individual nodes.

32. An apparatus for generating two-dimensional masks from a three-dimensional model comprising:  
means for providing a three-dimensional model representing a micro-electro-mechanical structure for manufacture and a description of process mask requirements;  
means for reducing the three-dimensional model to a topological description of unique cross sections;  
means for selecting candidate masks from the unique cross sections and the cross section topology; and  
means for reconciling the candidate masks based on the process mask requirements description to produce two-dimensional process masks.